5 Preparation of Surface

Patching

Wedge and Level

Base Widening

Cleaning

Tacking

Application
Curing

CHAPTER FIVE: PREPARATION OF SURFACE

HMA pavements may be placed:

1) Over existing pavements, either HMA or concrete

2) On newly constructed aggregate or HMA base courses

3) For widening contracts, on a combination of existing pavement and a base course

The existing surface is required to be compacted, stable, and free from mud or other foreign matter before placing the new HMA pavement. This may involve patching, leveling, wedging, and cleaning. The surface is required to be inspected for potholes, base failure, dips, and bumps to determine the need for corrections.

The requirements of the Contractor for surface preparation are designated in the QCP and the technician should be familiar with the procedures to be used on the contract.

PATCHING

Unsuitable areas are required to be identified and marked for removal. Areas to be removed include potholes, base failures, unstable mixes in place, and spots with excess asphalt. If the pavement to be patched is overlaid, the edge of the removal area is not required to be sawed. The removal area is required to conform to the marked lines to minimize overbreakage. If the patch is not overlaid, a neat edge for the patch is required to be attained by sawing. The size of the patches depends on the conditions found on the contract. The size and depth of the excavation are required to be measured and recorded for determination of the pay quantities.

Where unstable material is encountered below the existing pavement in the base, subbase, or subgrade, this material should be removed. The sides of the excavation should be vertical. The HMA may not be properly compacted against sloping sides. The bottom of the removal area is compacted and the area backfilled with suitable material up to the bottom of the existing pavement. The backfill material is placed in 6 inch lifts and compacted thoroughly.

Before placing the HMA patching material, the edges of the existing mat should be cleaned and tacked with asphalt to ensure a bond between the old surface and the new mix. In placing the patching mixture, the depth of each lift cannot exceed four times the maximum nominal particle size as shown on the DMF. Each lift is required to be compacted before placing the next lift. The surface of the patch should be between ¼ inch high and flush with the existing surface after compaction is completed.

Patching operations should be scheduled so that all removal areas opened during the day are completely patched at the close of the work day to allow opening the lane to traffic. When a patch cannot be completed, the HMA is backfilled, compacted, and a temporary surface placed to carry traffic during the night. All temporary work is at the expense of the Contractor and should be avoided if at all possible.

WEDGE AND LEVEL

When the surface of a pavement is irregular, the surface is required to be brought to a uniform grade and cross section. A leveling course is used when the road surface is so irregular that the surface cannot be corrected with the normal leveling capabilities of the paver. 19.0 mm intermediate and 9.5 surface mixtures are the only types of mix that may be used for leveling. Wedges of HMA are used to level sags and depressions in an old pavement prior to the paving operation.

Leveling and wedging material is required to be placed in lifts to ensure compaction. The top of each lift should be parallel to the desired profile or cross section as shown in Figure 5-1.

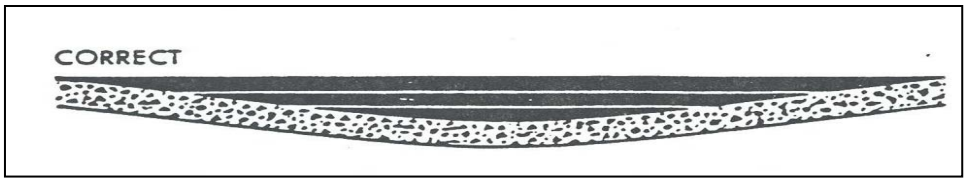

Figure 5-1. Correct Wedge and Level

Because of the difficulty of feathering the edges of HMA mixtures, placing the material in lifts parallel to the existing surface (Figure 5-2) will usually result in rough patches that reflect to the finished surface.

Figure 5-2. Incorrect Wedge and Level

The number and lengths of lifts are determined by the allowable lift thickness and the depth of the area to be leveled (Figure 5-3).

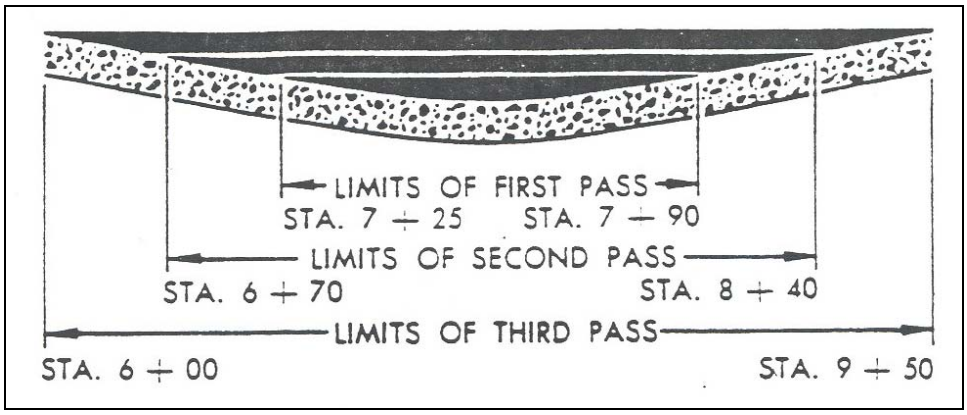

Figure 5-3. Wedge and Level Lifts

Wedges are also used to re-establish the crown on a tangent roadway or superelevation on a curve (Figure 5-4). The number of wedge courses necessary to rebuild the crown or superelevation depends on the total depth to be placed and the maximum aggregate size in the mix.

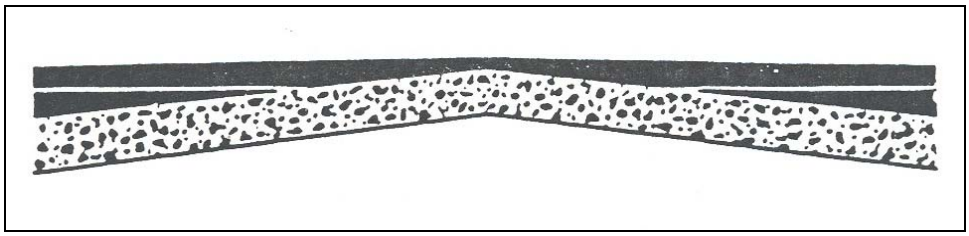

Figure 5-4. Crown Wedge

The finished depth of any course is required to be a minimum of two times and a maximum of four times the maximum particle size as shown on the Design Mix Formula (DMF). Feathering may be less than the minimum thickness requirements.

Acceptance of patching material and wedge and level is done on the basis of a Type D certification. This certification is required to be delivered to the jobsite each morning before any mix may be accepted. Typically, the first truckload of material is delivered with the Type D certification. A failure to supply a Type D certification on a daily basis should be reported to the PE/PS immediately. The Type D certification is required to report the air voids and binder contents of the mix. The allowable deviations from the DMF are 1.5% for air voids and 0.7% for the binder content. If the results do not comply with these requirements, the HMA is processed as a failed material.

BASE WIDENING

With the increased emphasis on rehabilitation of existing roadways, more contracts require widening and resurfacing. The width of the widening, whether on one or both sides, and the type of base mixture is indicated on the plans or specified in the contract.

The area to be widened is usually excavated with a trenching machine or motor grader, depending on the width. The subgrade is then compacted and the widened area backfilled to the planned line and grade. When the profile and alignment of the existing pavement edge is satisfactory, the edge may be used as a guide in excavating the widening trench. However, when either of these is irregular, field work and planning are required to establish line and grade before the Contractor begins work. Pavements to be surfaced are sometimes warped with variable or inverted crowns. On tangents, one edge may be higher than the surface at the centerline.

Typical examples of warped and non-uniform crowned pavements are shown in Figure 5-5. Sections needing correction may have excessive crown, one edge higher than the other, or no crown. In each instance, wedging is required. The controlling point for establishing the final profile is indicated by the arrows in Figure 5-5. The wedges are required to be placed before excavation of the widening sections is started so the Contractor has a good reference for line and grade.

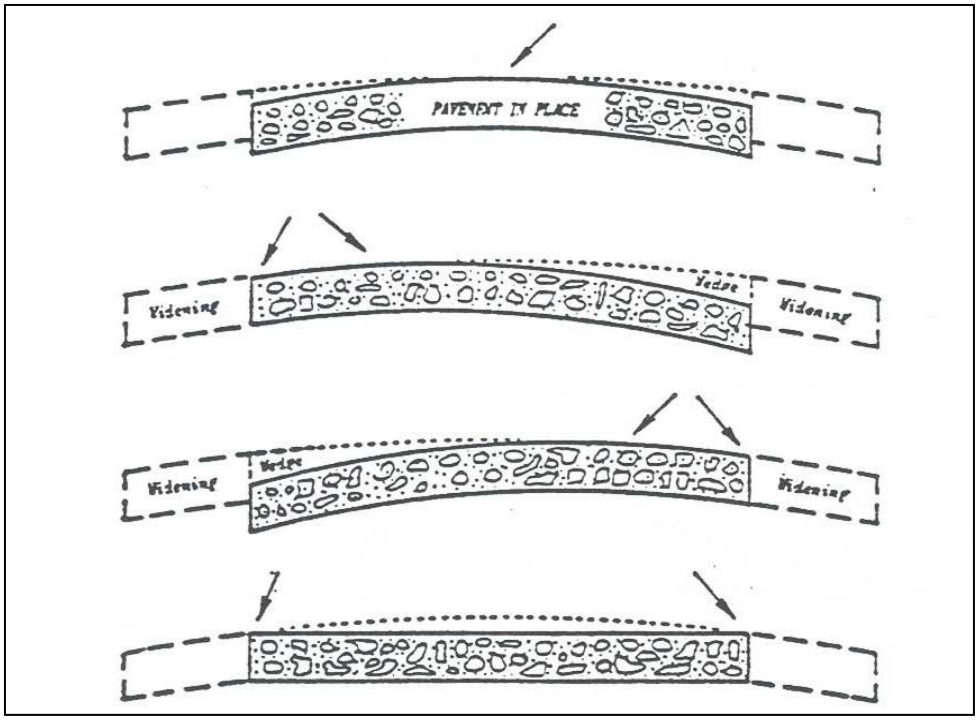

Figure 5-5. Warped and Non-Uniform Crowned Pavements

CLEANING

The existing surface is required to be cleaned before applying the tack coat. Normally, cleaning may be accomplished by sweeping, but sometimes mud or other foreign matter is required to be removed with shovels and hand brooms. Where dirt is embedded, a pressure washer or compressed air may be required for thorough cleaning. Contractors typically use power brooms for sweeping.

Excess asphalt material at cracks and joints is required to be removed to the elevation of the existing surface or below. Failure to remove the excess asphalt materials will result in "bleeding" of the asphalt through the subsequent courses causing bumps or other irregularities in the surface.

TACKING

A tack coat is the application of asphalt material to an existing paved surface. The primary purpose of the tack coat is to adhere to the old surface and the newly placed HMA. In addition, the tack coat coats the very fine particles of dust and softens and penetrates the existing HMA surface to allow some embedding and keying action between the courses.

Tack coats are covered by Section **406**. The material that is used for tacking is Asphalt Emulsion, AE-T or AE-PMT (Section **902.01(b)**).

APPLICATION

Tack coats should be applied so as to offer the least inconvenience to traffic and to permit one-way traffic without tracking or picking up of the material. Under no circumstances should the tack coat be applied so far in advance that the material is damaged by traffic. The area of pavement to be tacked in any day is required to be approved by the PE/PS. Typically, nearly all of the tacked area is covered by mix each day. If there is exposed tack coat, the material should be lightly sanded for the safety of traffic.

Tack coat may not be applied during wet or cold weather or to a wet surface. The quantity, rate of application, temperature, and areas to be treated are required to be approved before the Contractor applies the tacking material. In the event of rain or other circumstances where the tack coat remains uncovered, sufficient warning signs and flashers are required to be placed well in advance of the tack coat in both directions with intermittent flashers on the shoulder throughout the danger area.

The two essential requirements of a tack coat are:

1) The application of the asphalt material is required to be very thin

2) The material is required to uniformly cover the entire surface of the area to be paved

The asphalt material is required to be uniformly applied with a pressure distributor at a rate from 0.03 to 0.08 gallons per square yard unless otherwise specified or directed. The tack coat should not be applied too heavily. Too little tack is better than too much. The surface texture and absorption into the surface affects the desirable application rate.

The application rate depends on the speed of the truck, the length of the spray bar, the pump pressure, and the pump speed. Each distributor should be equipped with charts for determining the correct setting for the pump and truck speed for any given spray bar length and application rate. Since these vary for each make and model of distributor, the charts should be checked for the distributor in use (Figure 5-6). Tack should be applied uniformly without streaking or puddling. If a nozzle is not spraying properly, the distributor should be stopped immediately and the nozzle cleaned or adjusted. When streaking occurs, the Contractor should be directed to make the necessary adjustments to eliminate the condition. Puddling is required to be cleaned before placing the mix. Any asphalt remaining may cause bleeding into the mix creating an area with an excessive amount of asphalt. When the Contractor cannot get uniform coverage and streaking or puddling continues despite adjustments to the distributor, the use of a burlap drag may be required. The tack coat may be mopped, broomed, or squeegeed to obtain a more even distribution or to facilitate curing.

Streaking is usually caused by nozzles set at the wrong angle or having the spray bar at the wrong height. Nozzles should all be set at the same angle with the bar so the spray from one does not interfere with adjacent nozzles. Figure 5-7 indicates the correct angle for the distributor being used. The height of the spray bar should be such that a double or triple overlap is attained. The best results with 4-inch nozzle spacing may be attained with an exact triple lap of the spray fans. With 6-inch nozzle spacing, the height of the spray bar is too high and the spray is subject to wind distortion. A double lap pattern works better.

ASPHALT DISTRIBUTORS

Distributor	Nozzle Size	Nozzle Spacing	Nozzle Slot Angle	Nozzle Height Above Road	Pump Discharge gals/min or Pump Speed	Pump Pressure	Application Rate gal/yd²	Coverage
CHAUSSE	1/16 in.	4 in. 6 in.	45º with Spray Bar	6 in. to 15 in.	95 gals / min at 420 RPM	5 to 15 psi	Varies with size of Bar and speed of truck	4 in. Center – Triple Lap 6 in. Center – Double Lap
	1/8 in.	4 in. 6 in.	45º with Spray Bar	6 in. to 15 in.	95 gals / min at 420 RPM	5 to 15 psi	Varies with size of Bar and speed of truck	4 in. Center – Triple Lap 6 in. Center – Double Lap
	3/32 in.	4 in. 6 in.	45º with Spray Bar	6 in. to 15 in.	95 gals / min at 420 RPM	5 to 15 psi	Varies with size of Bar and speed of truck	4 in. Center – Triple Lap 6 in. Center – Double Lap
	3/16 in.	4 in. 6 in.	45º with Spray Bar	6 in. to 15 in.	95 gals / min at 420 RPM	5 to 15 psi	Varies with size of Bar and speed of truck	4 in. Center – Triple Lap 6 in. Center – Double Lap
ETNYRE	1/16 in.	4 in.	30º with Spray Bar	12 in.	5 to 7 gals / ft of Spray Bar	-	0.03 gal. to 3.0 gals.	Triple Lap
	3/32 in.	4 in.	30º with Spray Bar	12 in.	5 to 7 gals / ft of Spray Bar	-	0.03 gal. to 3.0 gals.	Triple Lap
	1/8 in.	4 in.	30º with Spray Bar	12 in.	5 to 7 gals / ft of Spray Bar	-	0.03 gal. to 3.0 gals.	Triple Lap
	3/16 in.	4 in.	30º with Spray Bar	12 in.	5 to 7 gals / ft of Spray Bar	-	0.03 gal. to 3.0 gals.	Triple Lap
	S36-5	4 in.	30º with Spray Bar	12 in.	5 to 7 gals / ft of Spray Bar	-	0.03 gal. to 3.0 gals.	Quadruple Lap
GRACE 200 Series	1/16 in.	6 in.	60º with Spray Bar	11 in.	100 gals./ min	35 psi	0.05 gal. to 1.0 gal.	Double Lap
	3/32 in.	6 in.	60º with Spray Bar	11 in.	100 gals./ min	35 psi	0.05 gal. to 1.0 gal.	Double Lap
300 Series	1/8 in.	4 in.	60º with Spray Bar	9 in.	100 gals./ min	35 psi	0.05 gal. to 1.0 gal.	Triple Lap
	3/16 in.	4 in.	60º with Spray Bar	9 in.	100 gals./ min	35 psi	0.05 gal. to 1.0 gal.	Triple Lap
LITTLEFORD	1/8 in. Square Slot	4 in.	15º with Spray Bar	10 in. min 12 in. max	12 ½ gals / min	-	0.05 gal. to 3.3 gals.	Triple Lap
	1/8 in. "V" Slot	4 in.	15º with Spray Bar	10 in. min 12 in. max	12 ½ gals / min	-	0.05 gal. to 3.3 gals.	Triple Lap
ROSCO	No. 0	4 in.	25º with Spray Bar	10 in.	-	10 to 15 psi	0.05 gal. to 2.0 gals.	Triple Lap
	No. 1	4 in.	25º with Spray Bar	10 in.	-	10 to 15 psi	0.05 gal. to 2.0 gals.	Triple Lap
	No. 2	4 in.	25º with Spray Bar	10 in.	-	10 to 15 psi	0.05 gal. to 2.0 gals.	Triple Lap
SEAMAN-GUNNISON	1/8 in.	4 in.	15º with Spray Bar	9 in.	375 gals / min at 375 RPM	-	0.1 gal. to 3.0 gals	Triple Lap
	3/16 in.	4 in.	15º with Spray Bar	9 in.	375 gals / min at 375 RPM	-	0.1 gal. to 3.0 gals	Triple Lap
SOUTH BEND (Municipal)	1/16 in.	4 in. 6 in.	22º with Spray Bar	9 in. min 11 in. max	90 gals / min to 375 gals / min	20 to 40 psi	0.1 gal. to 3.0 gals.	Triple Lap
	1/8 in.	4 in. 6 in.	22º with Spray Bar	9 in. min 11 in. max	90 gals / min to 375 gals / min	20 to 40 psi	0.1 gal. to 3.0 gals.	Triple Lap
	3/16 in.	4 in. 6 in.	22º with Spray Bar	9 in. min 11 in. max	90 gals / min to 375 gals / min	20 to 40 psi	0.1 gal. to 3.0 gals.	Triple Lap
STANDARD	1/16 in.	4 in.	45º with Spray Bar	9 in.	375 gals. / min at 675 RPM	50 psi	0.1 gal. to 1.0 gal.	Triple Lap
	5/32 in.	4 in.	45º with Spray Bar	9 in.	375 gals. / min at 675 RPM	50 psi	0.1 gal. to 1.0 gal.	Triple Lap

Figure 5-6. Asphalt Distributor Data

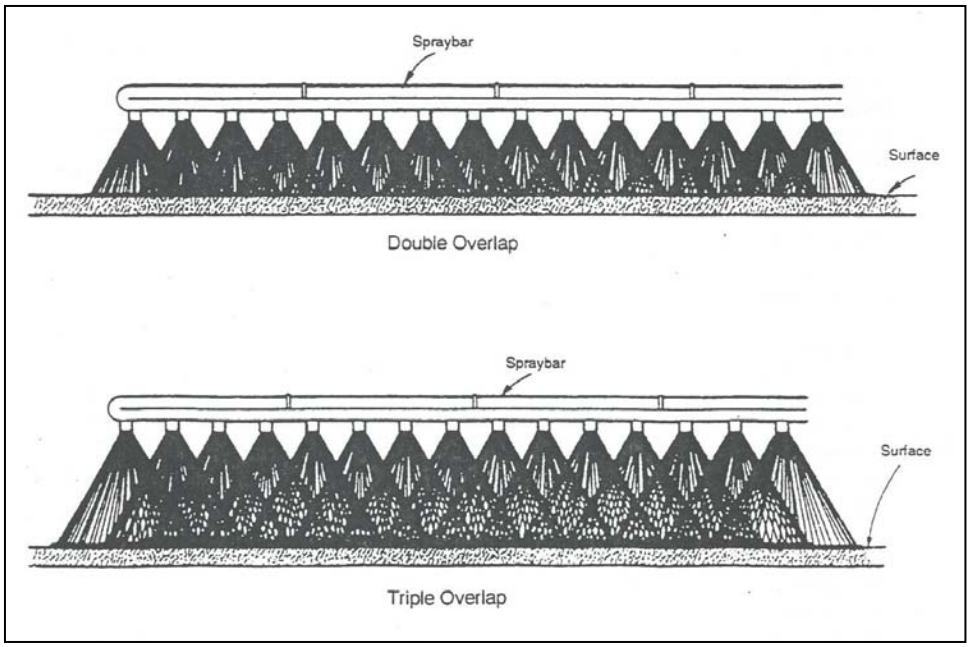

Figure 5-7. Tack Coat Overlap

The effects of having the spray bar too high or too low are excessive overlap or no overlap as shown in Figure 5-8.

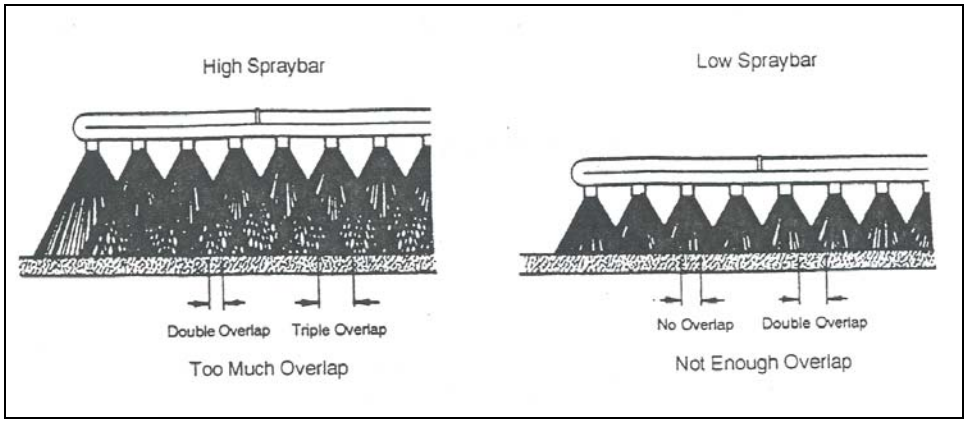

Figure 5-8. Spray Bar Height

Areas inaccessible to the spray bar should be tacked with the hand spray. Extreme care is required to be taken with the hand spray to obtain uniform coverage without puddling.

The tack coating operation is required to be conducted in such a manner that the material is not sprayed, splashed, or blown into adjacent curbs, gutters, walks, pavements, drives, or lawns. These problems may be prevented by attaching a simple shield to the end of the spray bar.

The distributor is required to be capable of applying the asphalt material in accurately measured quantities and at the specified rate of application. Immediately after applying a load or partial load of tack, the actual gallons used and the area covered should be measured. The rate of application is then computed by dividing the total gallons by the number of square yards covered. The rate is expressed in gallons per square yard. For emulsions, this rate includes the emulsifier and is required to be reduced if the application rate of the asphalt is required. To compute the rate for emulsions the actual application rate is multiplied by the percent of asphalt in the emulsion. Distributors are required to be equipped with an adequate volume measuring device, a thermometer to monitor the temperature of the tack coat, and the proper equipment to keep the tack thoroughly mixed and heated.

CURING

Time is required to allow the asphalt emulsions to break and cure before the HMA is placed on the tack coat. The emulsion turns from brown to black and becomes sticky when the material "breaks" and the water evaporates.